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10/749,670	12/30/2003	Deok-Yong Kim	2522-047	9761
<div>20575 7590 12/27/2007</div> <div>MARGER JOHNSON & MCCOLLOM, P.C.</div> <div>210 SW MORRISON STREET, SUITE 400</div> <div>PORTLAND, OR 97204</div>				
<div>EXAMINER</div> <div>ROSARIO, DENNIS</div>				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/749,670

Applicant(s)

KIM ET AL.

Examiner

Dennis Rosario

Art Unit

2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on AF 11/27/07.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to After Final Amendment

1. The after final amendment was received on 11/27/07. Claims 1-27 are pending.

Response to Arguments

2. Applicant's arguments, see REMARKS on page 6, second bullet, filed 11/27/07, with respect to the rejection(s) of claim(s) 1-8 and 19-27 under 102(e) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

However, upon further consideration, a new ground(s) of rejection is made in view of Kuwabara (US Patent 6,980,686 B2) in view of Tanaka et al. (US Patent 7,116,816 B2).

Note that the rejections of claims 9-18 are maintained since claims 9-18 are apparatus claims wherein no functional limitations are given weight. Since there were no remarks regarding the structure of claims 9-18, the rejection of claims 9-18 is maintained.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 9,10,13,15-18 are rejected under 35 U.S.C. 102(e) as being anticipated by Kuwabara (US Patent 6,980,686 B2).

Regarding claim 9, Kuwabara teaches an apparatus for detecting a defect on a substrate, the apparatus comprising:

a) a support (fig. 1,num. 18) for supporting a substrate, wherein the substrate has a plurality of device units formed thereon, each device unit including a plurality of pixels;

b) a light source (fig.1,num. 12) for irradiating a light on the substrate;

c) an image detector (fig. 1,num. 17) for sensing a reflecting light reflected by a surface of the substrate from the light source;

d) a data processing unit (fig.1 ,num. 21) for calculating a raw datum of a target pixel by subtracting digital image information of a corresponding pixel from digital image information of the target pixel, wherein the corresponding pixel is located in a first device unit that is adjacent to a second device unit that includes the target pixel, the corresponding pixel corresponding to the target pixel;

e) a setting unit (fig. 3,num. 103) for presetting a threshold region, wherein the threshold region includes at least one pair of upper and lower limits; and

f) a judging unit (fig. 3,num. 104) for judging whether or not the target pixel is a defective pixel by comparing the raw datum of the target pixel with the threshold region.

Regarding claim 10, Kuwabara discloses the apparatus of claim 9, wherein

- a) the substrate is a wafer for fabricating a semiconductor device and
- b) the plurality of device units are unit cells operating as independent electronic circuits on the wafer.

Claim 13 is rejected the same as claim 6. Thus, argument similar to that presented above for claim 6 is equally applicable to claim 13.

Regarding claim 15, Kuwabara discloses the apparatus of claim 9, wherein the image detector includes a photo-sensor (fig. 1,num. 17).

Regarding claim 16, Kuwabara discloses the apparatus of claim 9, wherein the image detector generates the analog image information for each pixel of each device units (fig. 1).

Claim 17 is rejected the same as claim 16. Thus, argument similar to that presented above for claim 16 is equally applicable to claim 17.

Claim 18 is rejected the same as claim 9. Thus, argument similar to that presented above for claim 9 is equally applicable to claim 18.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1,2,5-10,13-21 and 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuwabara (US Patent 6,980,686 B2) in view of Tanaka et al. (US Patent 7,116,816 B2).

Regarding claim 1, Kuwabara discloses a method of detecting a defect on a substrate, the method comprising:

a) irradiating (fig. 6,num. 12) a light on a substrate (fig. 6,num. 19), wherein the substrate has a plurality of device units (fig. 2A) formed thereon with the same pattern, the plurality of device units each including a plurality of pixels (since fig. 2A is imaged);

b) measuring image information (as indicated in fig. 2A: "COMPARED") for the plurality of pixels by sensing the light reflected by a surface of the substrate from the irradiating light;

c) calculating a raw datum (fig. 11,num. 223) of a target pixel by subtracting the image information of a corresponding pixel from the image information of the target pixel (to obtain a "differential image" in col. 10, line 4), wherein the target pixel is a subject pixel for detecting a defect, and wherein the corresponding pixel is located in a first device unit that is adjacent to a second device unit (displaced in time via fig. 7,num. 206) that includes the target pixel, the corresponding pixel corresponding to the target pixel;

d) presetting a threshold (corresponding to fig. 11,num. 224).

Kuwabara does not teach the remaining limitations of:

e) a threshold region including at least one pair of upper and lower limits;
f) comparing the threshold region with the raw datum; and
g) marking the target pixel as defective if the raw datum is within the threshold region.

However, Kuwabara does teach that the threshold of fig. 11, num. 224 is "not restricted" in col. 10, line 17; thus, the threshold value can be modified.

Tanaka teaches a threshold that is used with difference images (fig. 20 which corresponds to fig. 19:DIFFERENCE IMAGE) and the remaining limitations of claim 1 of:

- e) a threshold region (fig. 20,num. 49) including at least one pair of upper and lower limits (since the values of fig. 20 are "not the absolute value" in col. 19, line 53);
- f) comparing the threshold region with the raw datum (as seen in figures 20 and 21, num. 49); and
- g) marking the target pixel as defective if the raw datum is within the threshold region (as shown by the legend in fig. 21,num. 26).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Kuwabara's differential image for thresholding with Tanaka's difference images for thresholding, because Tanaka's teaching provides an "easy" in col. 20, line 11 classification of defects so that an operator can take corrective action for each type of classified defect.

Regarding claim 2, Kuwabara of the combination teaches the method of claim 1, wherein the substrate includes:

- a) a wafer (fig. 1,num. 19) for fabricating a semiconductor device, and
- b) the plurality of device units (fig. 2A) are unit cells operating as independent electronic circuits on the wafer.

Regarding claim 5, Kuwabara of the combination teaches the method of detecting a defect on a substrate of claim 1, wherein the image information includes binary digital information (fig. 7,num. 205: 2-BIT IMAGE).

Regarding claim 6, Kuwabara of the combination teaches the method of detecting a defect on a substrate of claim 5, wherein the image information represents a level on a gray scale (corresponding to fig. 7, num .201: GRAY LEVEL IMAGE DATA), wherein the gray scale is distinguishable by a relative density of black and white.

Claim 7 is rejected the same as claim 6. Thus, argument similar to that presented above for claim 6 is equally applicable to claim 7.

Regarding claim 8, Tanaka of the combination teaches the method of detecting a defect on a substrate of claim 1, further comprising:

- a) displaying the defective pixel on a monitor (fig. 1,num. 17).

Claims 9,10,13 and 14 are rejected the same as claims 1,2,7 and 8. Thus, argument similar to that presented above for claims 1,2,7 and 8 of a method is equally applicable to claims 9,10,13 and 14 of an apparatus, respectively.

Regarding claim 15, Kuwabara of the combination teaches the apparatus of claim 9, wherein the image detector includes a photo-sensor (fig. 1,num. 17).

Regarding claim 16, Kuwabara of the combination teaches the apparatus of claim 9, wherein the image detector generates the analog image information for each pixel of each device units (fig. 1).

Claim 17 is rejected the same as claim 16. Thus, argument similar to that presented above for claim 16 is equally applicable to claim 17.

Claims 18 and 21 are rejected the same as claim 1. Thus, argument similar to that presented above for claim 1 is equally applicable to claims 18 and 21.

Claim 19 is rejected the same as claim 1. Thus, argument similar to that presented above for claim 1 is equally applicable to claim 19.

Claim 20 is rejected the same as claim 1. Thus, argument similar to that presented above for claim 1, last limitation is equally applicable to claim 20.

Claims 24-27 are rejected the same as claims 5, 6 and 8. Thus, argument similar to that presented above for claims 5, 6 and 8 is equally applicable to claims 24-27.

7. Claims 3,4,11,12,22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuwabara (US Patent 6,980,686 B2) in view of Spaeth (US Patent 2,349,012).

Regarding claim 3, Kuwabara of the combination does not teach the limitations of claim 3, but teaches using a illuminating light as shown in fig. 5 which suggests to one of ordinary skill in the art of light sources a selection of light sources.

Spaeth teaches a light source and the remaining limitation of claim 3 of

a) the irradiating light includes a short-wave light ("shortwave radiant energy" page 5, right column, lines 40,41).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use Spaeth's teaching of shortwave radiant energy with Kuwabara's teaching of the illuminating light, because Spaeth's teaching can generate an "illuminating light source of high efficiency" in page 5, right column, lines 43,44 using the shortwave radiant energy.

Claim 4 is rejected the same as claim 3. Thus, argument similar to that presented above for claim 3 is equally applicable to claim 4.

Claims 11,12,22 and 23 are rejected the same as claims 3 and 4. Thus, argument similar to that presented above for claims 3 and 4 is equally applicable to claims 11,12,22 and 23.

8. Claims 3,4,11,12,22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuwabara (US Patent 6,980,686 B2) in view of Tanaka et al. (US Patent 7,116,816) as applied to claim 1, above, further in view of Spaeth (US Patent 2,349,012).

Regarding claim 3, Kuwabara of the combination does not teach the limitations of claim 3, but teaches using a illuminating light as shown in fig. 5 which suggests to one of ordinary skill in the art of light sources a selection of light sources.

Spaeth teaches a light source and the remaining limitation of claim 3 of

a) the irradiating light includes a short-wave light ("shortwave ra-diant energy" page 5, right column, lines 40,41).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to use Spaeth's teaching of shortwave radiant energy with Kuwabara's teaching of the illuminating light, because Spaeth's teaching can generate an "illuminating light source of high efficiency" in page 5, right column, lines 43,44 using the shortwave radiant energy.

Claim 4 is rejected the same as claim 3. Thus, argument similar to that presented above for claim 3 is equally applicable to claim 4.

Claims 11,12,22 and 23 are rejected the same as claims 3 and 4. Thus, argument similar to that presented above for claims 3 and 4 is equally applicable to claims 11,12,22 and 23.

9. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kuwabara (US Patent 6,980,686 B2) in view of Lin et al. (US Patent 6,091,846).

Regarding claim 14, Kuwabara does not teach claim 8, but teaches a "visual inspection" in col. 4, line 46 and an ADC system that is "Conventionally" in col. 4, line 45 used.

Lin teaches an "ADC" in col. 19, line 31 system and visual inspection using "visual characteristics" in col. 31, lines 54,55 as suggested by Kuwabara and claim 14 of:

a) displaying the defective pixel on a monitor (or "displays...defect images" in col. 7, lines 1-3).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Kuwabara's teaching of ADC and visual inspection with Lin's teaching of displaying defect images, because Lin's teaching enables an operator "to obtain an overall view of defect patterns and trends, or to diagnose specific defects" in col. 7, lines 3-5.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Maeda et al. (US Patent 7,274,813 B2) is pertinent as teaching an upper and lower thresholds in figure 24, num. 48.

Hiroi et al. (US Patent 7,269,280 B2) is pertinent as teaching upper and lower thresholds as shown in fig. 17, numerals 410 and 411.

Do et al. (US Patent 6,175,417 B1) is pertinent as teaching upper and lower thresholds as shown in figure 4a, numerals 513 and 518.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Rosario whose telephone number is (571) 272-7397. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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